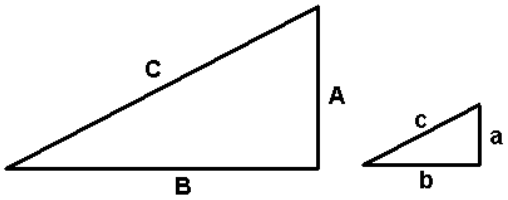
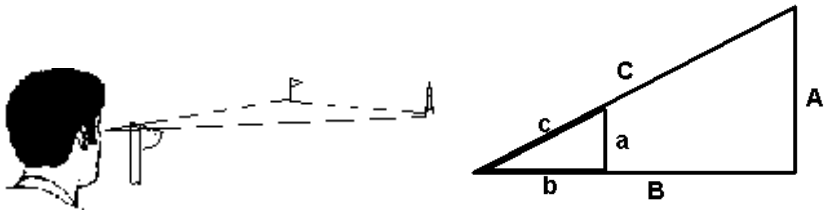
Using the Principle of Similar Triangles to Calculate the Distance to the Launch Pad

A characteristic of similar triangles–two triangles whose corresponding angles are equal–is that the ratio of the corresponding sides is equal.



$$\frac{A}{B} = \frac{a}{b} \qquad \frac{A}{B} \times \frac{a}{b} \qquad Bxa = bxA \qquad B = \frac{A \times b}{a}$$

The two triangles above are similar so the ratios of A to B and a to b are equal. By cross multiplying and then dividing both sides by "a," we are able to solve for "B."



Hold the 100 units long measured string close to your eye and match an actual length at the launch site (like the distance from the rocket to a flag that you measure with a tape measure) to the apparent length on the edge of your tracker. This creates two similar triangles with three known lengths.(A, a, and b) You can now calculate the distance to the launch pad (B) by multiplying "A" to "b" and dividing by "a."

Example 1

1. With a measuring tape, your launch master set a flag exactly 90 feet due West of the launch pad.
2. You walk due South of the launch pad until the apparent length between the pad and the flag is 9 on your tracker.
3. To calculate your distance from the pad, multiply the actual length from pad to flag (90 ft) by 100 and divide by the apparent length (9). You are 1000 feet from the launch pad.

Example 2

1. Your launch master stands 5 feet 9 inches (5.75 feet) tall.
2. From your position, he has an apparent length (height) of 0.5 on your tracker scale.
4. To calculate your distance from the pad, multiply the actual length (height – 5.75 feet) by 100 and divide by the apparent length (0.5). You are 1150 feet from the launch pad. (See Note)

Notice that the ratio (a/b) is the definition of the tangent for the angle opposite side "a." We will explore this further in the discussion on tangents.

Note: When the apparent length measurements are small, as in this second example, small errors in measurement result in large errors in distance to the pad. It is best to use a known length at the launch site that is as large as possible.

Jackson, W. H., (2003). Using the Principle of Similar Triangles to Calculate the Distance to the Launch Pad. [On-line]. Available: http://nmwg.cap.gov/santafe/Activities/PDF/SimilarTrianglesBackground.pdf.